

Life After Implementing Your Road Data Model

*Are you saying that we have to
maintain this data?*



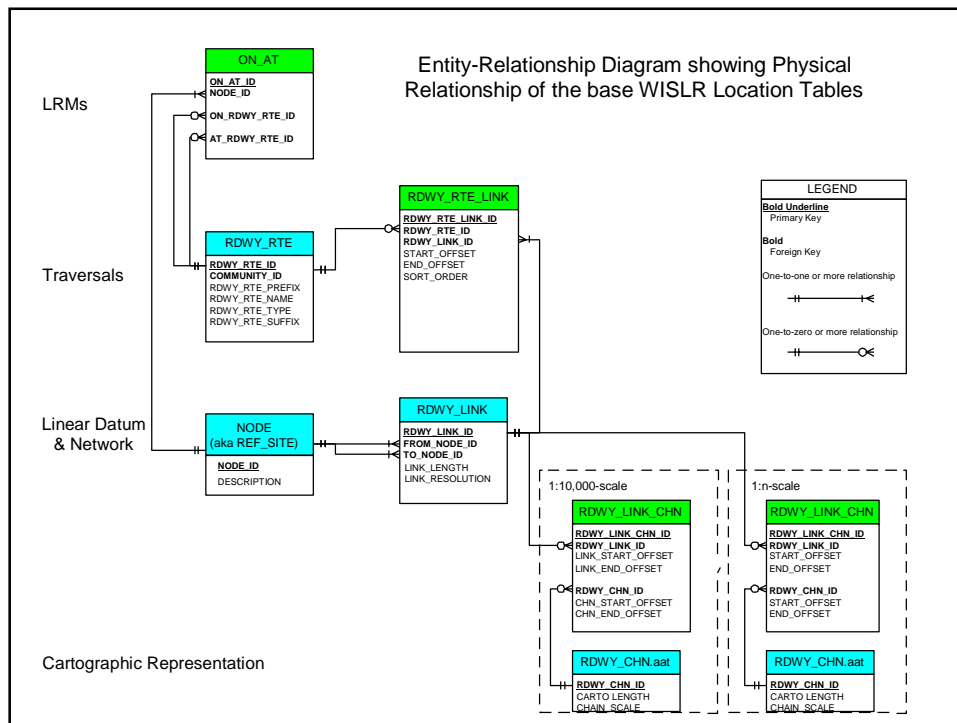
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Introduction

- Existing app to maintain STN LRS data
 - Approximately 15,000 miles of roadway
 - 7 year old application (Workstation Arc/Info, AML & coverages)
 - Timeliness of updates not a major concern
 - Only a couple of users editing LRS data
- Extending data to include all public roads
 - 110,000+ miles of roadway
 - Timeliness of updates a major issue
 - Up to a dozen users editing LRS data

Problem Statement

- More complex road data models require more complex interface to maintain data.
- Normalized data structures involve tables not easily understood by non-IT staff.
 - More so than non-spatial data maintenance apps
- Decentralized updates to LRS data involve more users editing at any one time.
 - More training required – more support
 - Breadth of knowledge among users varies



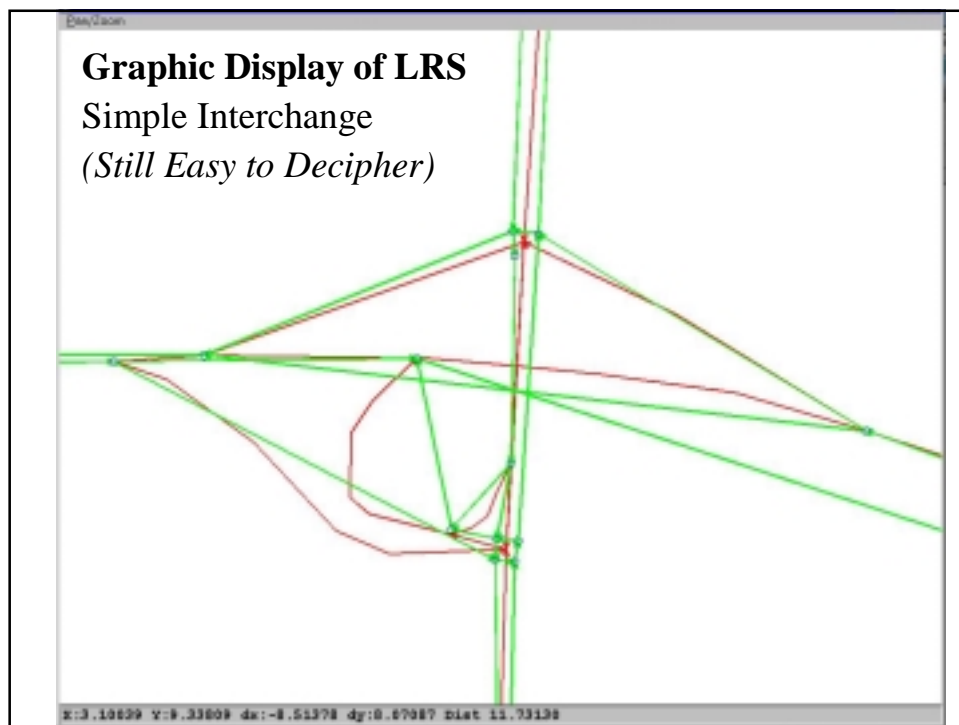
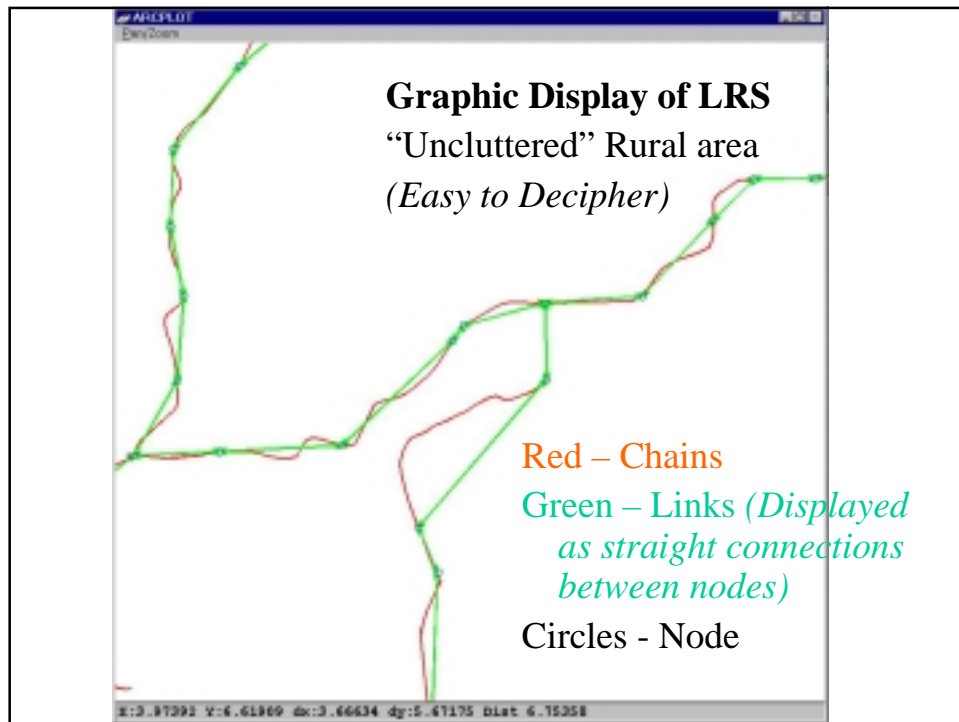
Sample of Edit Functions - Old

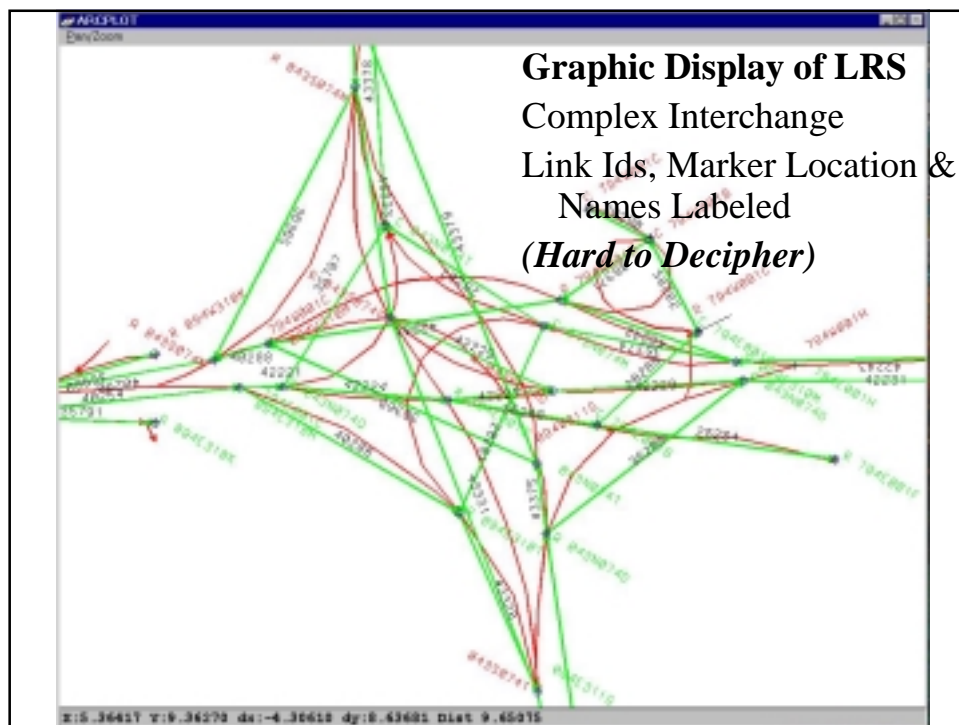
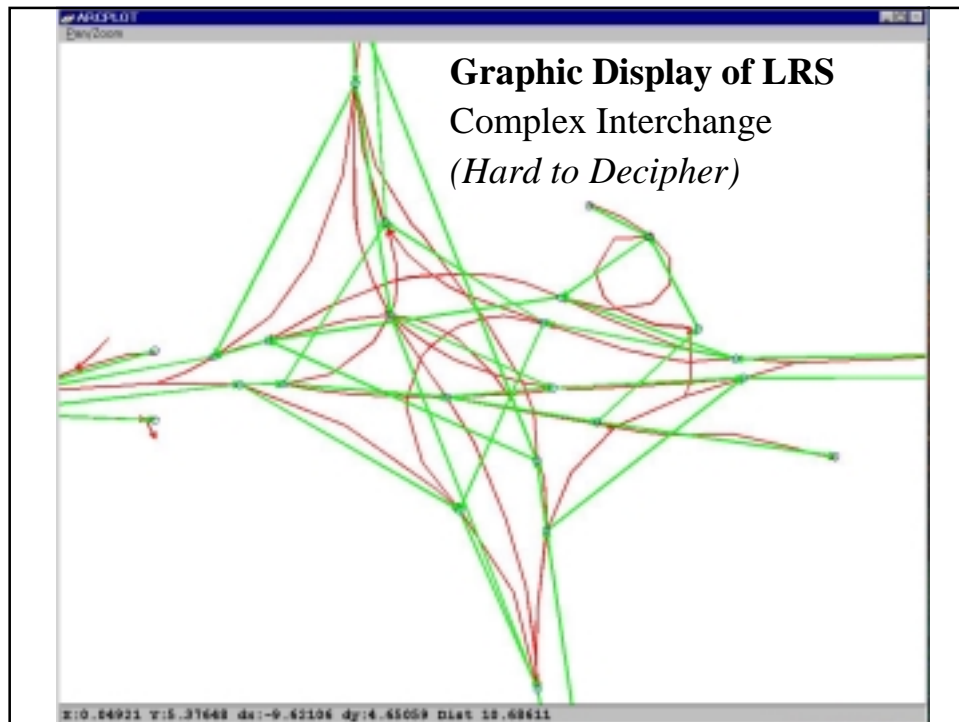
“Association Table” Edits – Edits to Associate the:

- Cartography to the Datum
- Network to the Datum
- Traversals to the Network
- Still valid portions of a retired Anchor Section to the corresponding portion of its replacement Section.
 - Allow automatic retying of business data where the roadway hasn't been altered but the Anchor Section representing it has been retired.

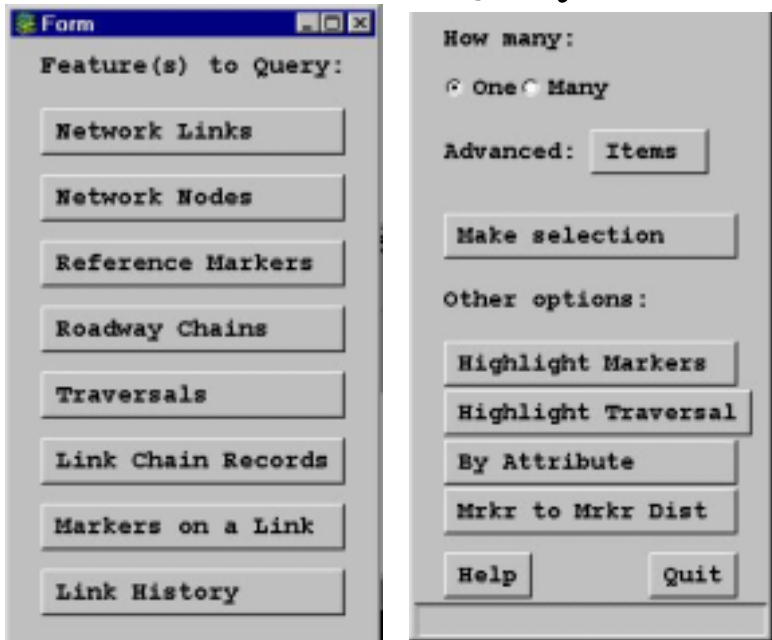
Edit Functions Issues - Old

- Edits work on the entity level.
 - Edits that can be performed on one database table at a time.
- User needs to know details of all tables.
 - What is a Traversal and how does it relate to a Link?
- Not very efficient to perform edits.
 - Ex.- Multiple edits required to add a road (Add A.S. & A.P., Add Nodes & Links, Add Traversals, etc.)
- ***However: Every scenario can be handled; Different users can be assigned different edit tasks (multiple LRMs & cartographies).***





Custom Menu to Query the Data



Form

Feature(s) to Query:

- Network Links
- Network Nodes
- Reference Markers
- Roadway Chains
- Traversals
- Link Chain Records
- Markers on a Link
- Link History

How many:

☒ One ☐ Many

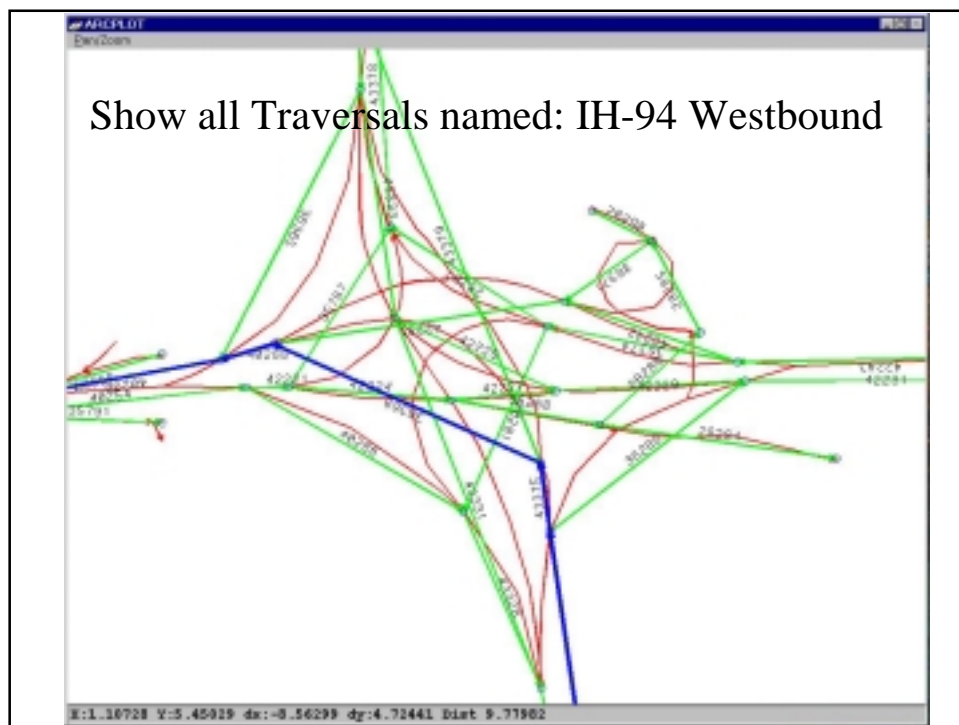
Advanced: **Items**

Make selection

Other options:

- Highlight Markers**
- Highlight Traversal**
- By Attribute**
- Mrkr to Mrkr Dist**
- Help** **Quit**

Show all Traversals named: IH-94 Westbound



Edit Selection Menu – Top Half

Transaction Number:

Transaction Type:

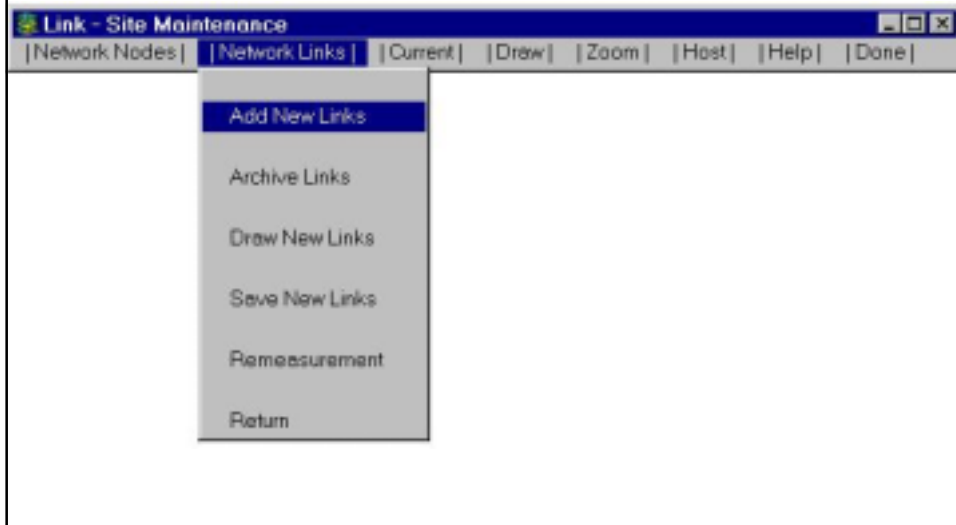
Transaction Types (Select One)

- ☐ Network Link/Node Maintenance - Add Links/Nodes, archive existing Links/Node, change status of pre-current Links/Nodes to current.
- ☐ New Route - Add a new Route name only, NO Traversals.
- ☐ Traversal Maintenance - Add/Archive Traversals, change status of pre-current Traversals to current.
- ☐ Route Reference Marker Maintenance - Add new Reference Markers to existing Links, archive existing Markers, change status of pre-current Markers to current.
- ☐ Node Geometry Maintenance - Used to change cartographic location of existing Network Nodes. No attribute changes.

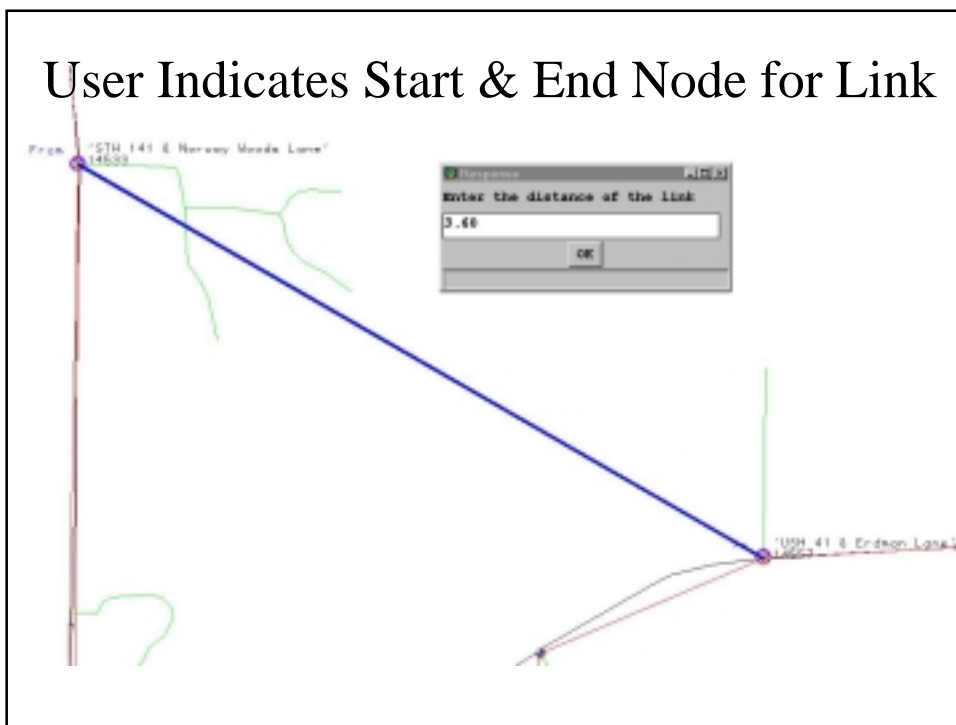
Edit Selection Menu – Bottom Half

- ☐ Reference Marker Geometry Maintenance - Used to change cartographic location of existing Markers. No attribute changes.
- ☐ Road Chain Maintenance - Add new, archive existing or make current Roadway Chains.
- ☐ Link/Chain Maintenance - Add new, adjust existing, make current or archive Road chains and/or Link/Chains.
- ☐ Check Out Additional Features - Checks out additional features.
- ☐ Suspend the Transaction - Suspends the current transaction.
- ☐ Help - Provides a detailed description of each transaction type.

User Selects Edit to be Performed (Add a New Link)



User Indicates Start & End Node for Link



Additional Information to Add Link

The screenshot shows a window titled 'Form' with a blue title bar. Inside, the text 'Enter Status, Date and OTF Date for these new Roadway Links:' is displayed. Below this, there are several input fields and a status selection area. The 'Project Id' field contains '999999999'. The 'Status' section has three radio buttons: 'Pre-Current' (selected), 'Current', and 'Historical'. The 'Date Current (Open for Traffic)' field contains '06/01/2001'. The 'Date Measurement Taken' field contains '05/20/2001'. The 'Date Historical' field is empty. The 'Distance Measurement Source' field contains 'Derived From COGO Coordinates'. At the bottom, there are three buttons: 'Save', 'Help', and 'Cancel'.

Form

Enter Status, Date and OTF Date for these new Roadway Links:

Project Id: 999999999

Status: ☒ Pre-Current ☐ Current ☐ Historical

Date Current (Open for Traffic): 06/01/2001

Date Measurement Taken: 05/20/2001

Date Historical:

Distance Measurement Source: Derived From COGO Coordinates

Save Help Cancel

Editing the LRS - Old

To complete the LRS for this road, the user still needs to add:

- Traversals
- LRMs (Reference Markers, Lightpoles, etc.)
- Cartography (Chains)
- Associations between tables
- *All are performed as an individual edit (Can be very inefficient).*

Editing the LRS - Old

- Realization of inefficiencies of this approach.
- 1995 - Started to generate automatic reports listing related data that need edits.

Edit Function: Retire Link

Other Edits Needed: Retire Traversals, LRMs and potentially Nodes related that that Link

- 1997 – First “Higher-level” Edit tool

Edit Function: Remeasure Link

Edits Performed by Tool: Automatically retire Link, Traversals, LRMs, etc.; Automatically adds replacement Link, Traversals, LRMs, etc.

Editing the LRS - New

- Driven by real-world events.
 - A road was re-aligned
 - A road’s name was changed...
- Accomplished by obtaining the necessary information to perform an edit.
 - **In a way that is more intuitive and efficient for the user.**
- New technology available for GIS development allows this approach to be taken.

Sample of Edit Functions - New

Datum & Carto Edits

- Add Road
- Remove Road
- Extend/Short Road
- Re-align Road
- Add Subdivision
- Remeasure Road (Datum edit only)
- New centerline source (Carto edit only)

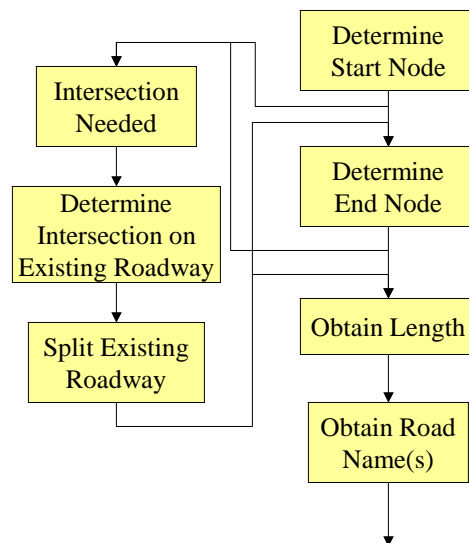
Network Edits

- Change Access Control
- Alter Traffic Flow (1-way to 2-way, etc.)

Traversal Edits

- Add Road Name
- Remove Road Name
- Shorten/Extend Rte Path
- Rename Road Name
- Alter Route Path

Portion of “Add Road” Process Flow



Editing the LRS - New

- Path through the flow chart determines which edit tools are called.
- Information obtained is the input to the edit tools.
- Edits performed to database only after all of the necessary information is completely obtained:
 - Increase of QA/QC, User has more time to think about commits.
- ***Still require programs that perform the basic edit functions (GUI is removed).***
 - *Add Link, Remove Link, Add Traversal, etc.*
- ***More difficult to manage multiple LRMs & Carto.***

“Add Road” Edit – Road Names

The screenshot shows a software window titled "Add Road". At the top, there are two input fields for "Length:" with units "feet" and "miles". Below this is a tabbed interface with three tabs: "Road Name(s)", "Direction of Travel", and "Reason(s)". The "Road Name(s)" tab is active, showing a table with two columns and two rows. The first row has a single cell containing "Data1". Below the table are four buttons: "Add Existing Name", "Create a New Name", "Remove a Name", and "Edit a Name". At the bottom of the window, there is a "Data1" label with a left arrow, a right arrow, and two buttons labeled "Ok" and "Cancel".

“Add Road” Edit – Network Topology

The "Add Road" dialog box for Network Topology includes the following fields and options:

- Length:** Two input fields for "feet" and "miles".
- Tabbed Interface:** Three tabs labeled "Road Name(s)", "Direction of Travel", and "Reason(s)". The "Direction of Travel" tab is currently selected.
- Direction of Travel Section:**
 - Contains three icons representing different road types: Two-Way, One-Way, and Two to One-Way.
 - Each icon has a corresponding radio button: ☒ Two-Way, ☐ One-Way, and ☐ Two to One-Way.
- Point of Convergence/Divergence Section:**
 - Fields for "From Road:" (containing "First St") and "Toward Road:" (containing "Second St").
 - "Offset Distance:" with "feet" and "miles" input fields.
 - Radio buttons for ☐ Becomes One-Way and ☐ Becomes Two-Way.
- Footer:** A data list with "Data1" and "Ok" / "Cancel" buttons.

“Add Road” Edit – Lineage/Other

The "Add Road" dialog box for Lineage/Other includes the following fields and options:

- Length:** Two input fields for "feet" and "miles".
- Tabbed Interface:** Three tabs labeled "Road Name(s)", "Direction of Travel", and "Reason(s)". The "Reason(s)" tab is currently selected.
- Reason(s) Section:**
 - Four dropdown menus labeled: "Mileage Change Reason:", "Legal Action Type:", "Road Category:", and "Road Sub-Category:".
- Footer:** A data list with "Data1" and "Ok" / "Cancel" buttons.

“Rename Road Name” Edit

Rename a Road

Select a Road to Rename:

Old Road Name:
County:
Municipality:
Road Name:

What should the new Road Name be?

New Road Name:
County:
Municipality:
Road Name:

Do you wish to Rename:

☒ Entire Road in the municipality
☐ Part of the Road in the municipality
☐ Entire Road including connected municipalities

Summary

- New technology (Hardware/Software/Database) allows this to happen.
 - What was once part of the application programming can now be embedded as part of the data model – Object/Relational.
 - An Object’s methods and behaviors.
 - Database triggers and constraints.
 - Fewer custom tools needed: Pan/Zoom, Named Extents, Query & Find tools
 - Similar look & feel to other “Commerical-Off-The-Shelf” software.

Summary

- Data and edits are presented to the user in a manner that is already familiar.
- Graphic display is less cluttered, making it easier to perform edits.
- Users aren't stupid, it is possible to “over-do” this approach.
 - Balance ease-of-use with level of productivity
 - Allow some flexibility in process flow
 - Establish a base-line minimum of LRS knowledge required by the user